

# THE REVIEW ON A STRUCTURE OF THE SPINAL NERVES

The spinal nerves (*nervi spinales*) formed the neuromeres corresponding to the myotomes (*myomeres*) of the trunk and alternate with the segments of the spine (spinal cord). Each spinal nerve nerve (Fig. 1; Sch. 1) supplies a corresponding area of skin - the dermatome (Fig. 2; Fig. 3; Fig. 4).

There are 31 pairs of spinal nerves, which are separates in some divisions, which are (Fig. 2; Fig. 3; Fig. 4):

- I Eight pairs of the cervical nerves (*nervi cervicales*). The abbreviations are: from C 1 to C 8;
- II Twelve pairs of the thoracic nerves (*nervi thoracici*). The abbreviations are: from T 1 to T 12 or Th 1 to Th 12, or D 1 to D 12;
- III Five pairs of the lumbar nerves (*nervi lumbales*). The abbreviations are: from L 1 to L 5;

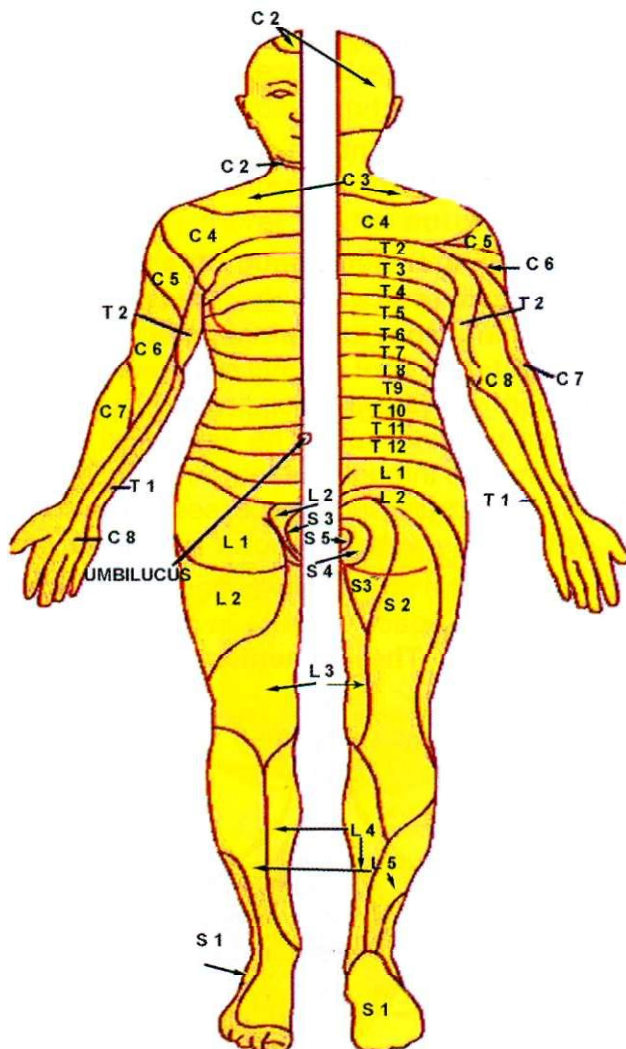


Fig. 1. Zones of spinal nerves innervation.

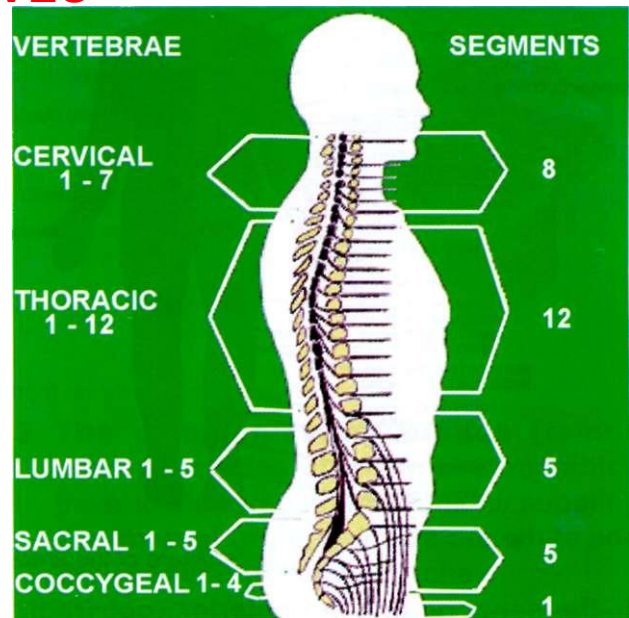


Fig. 2. Relations between vertebrae and segments of spinal cord.

- IV Five pairs of the sacral nerves (*nervi sacrales*). The abbreviations are: from S 1 to S 5;
- V. One, or two pairs of the coccygeal nerves (*nervi coccygei*). The abbreviations are Co (1-2).

Each spinal nerve (Fig. 5; Fig. 6) is a mixed nerve and forms by two roots:

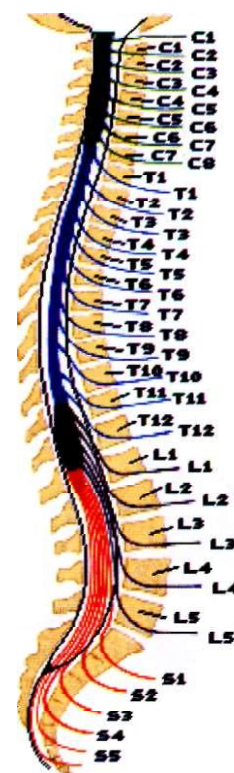


Fig. 3. Enlargments of spinal cord.

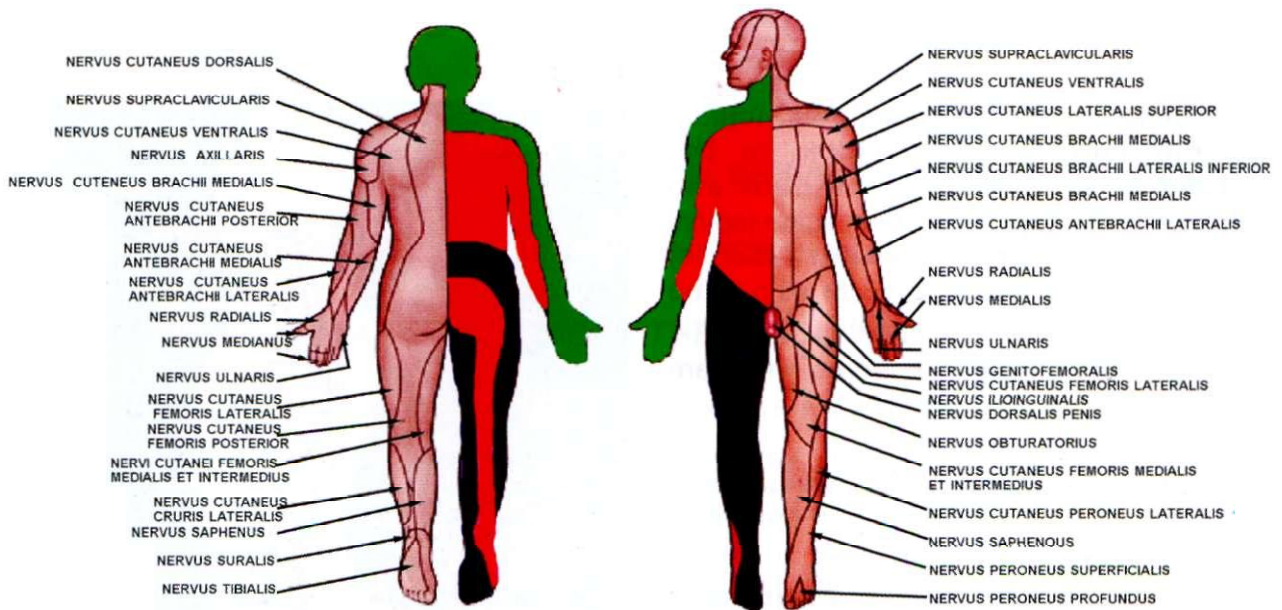


Fig. 4. Structure of the areas of spinal plexuses innervation.

- 1 the sensory, or the posterior root (**radix dorsalis seu posterior, seu sensorius nervi spinalis**), which arise from the spinal cord in the region of the **posterior lateral sulcus (sulcus lateralis posterior medullae spinalis)** by the rootlets of the posterior root (**fila radicularia radices dorsalis**) and
- 2 the motor, or anterior root (**radix ventralis seu anterior, seu motoriusw nervi spinalis**), which arise from the spinal cord in the region of the **anterolateral sulcus** by the rootlets of the anterior root (**fila radicularia radices ventralis**).

The **spinal ganglion (ganglion spinale)** formed by cell bodies of sensory neurons. The posterior roots are thicker. Most spinal ganglia are situated in the intervertebral foramina. The lower lumbar ganglia are situated partly in the vertebral canal. The sacral ganglia, except for the last one, lie in the vertebral canal extradurally. The spinal ganglion of the coccygeal nerve lies in the

subdural space. The roots unite and form the **spinal nerve (nervus spinalis)**. Since both roots are joined the spinal nerves continued as mixed nerves. They contains (Fig. 7):

- a. **Sensory or afferent, or ascending fibres - originate from the cells of the spinal ganglia.**
- b. **Motor or efferent, or descending fibres - originate from the cells of the anterior horn.**
- c. **Vegetative or autonomic fibres originate from the cells of the lateral horns emerging from the spinal cord as part of the anterior root.** In the opinion of certain authors vegetative fibres are also contained in the posterior root. The vegetative fibres, which pass through the roots into the animal nerves, ensure such processes in the soma as **trophies, vasculo-motor reactions, etc.**

The roots of the spinal nerves pass firstly in the subarachnoid space and are invested, directly in the pia mater. **The ligamentum denticulatum**

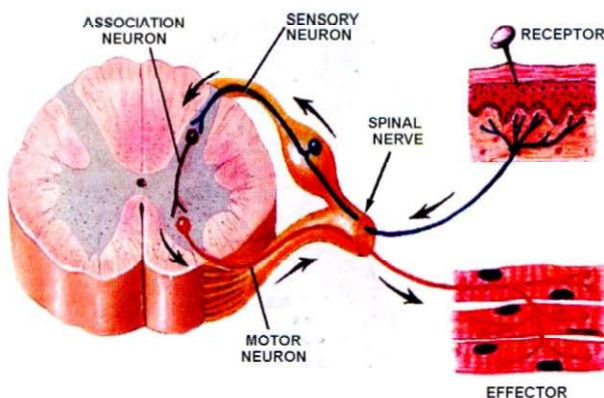


Fig. 5. Structure of the reflex arc.

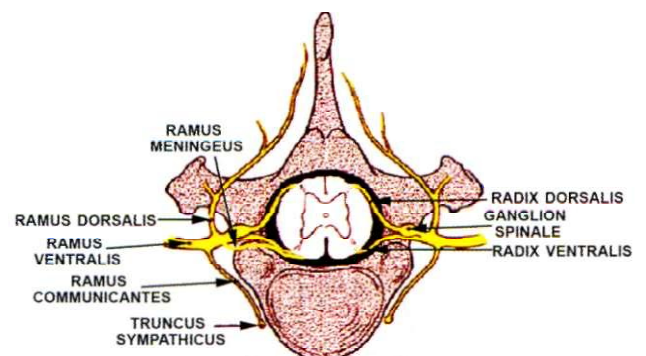


Fig. 6. Structure of the spinal nerve.

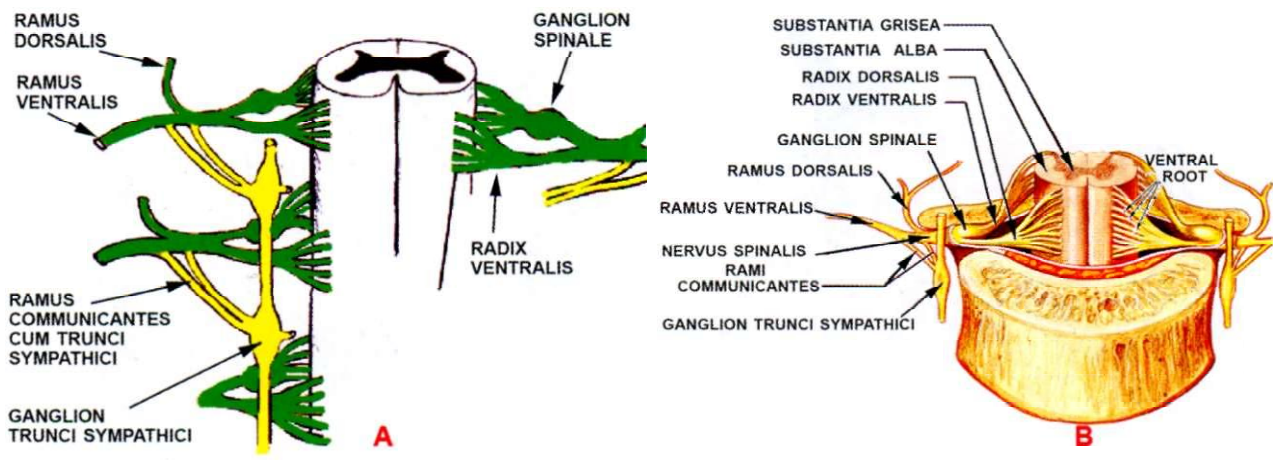


Fig. 7. Structure of the spino-vertebral segment (A - without vertebral column, and B - with it).

(**ligamentum denticulatum**) runs between the anterior and posterior roots in the subdural space. **The three meninges invest closely the roots approaching the intervertebral foramina, fuse with one another close to the spinal ganglion and are continuous with the sheath of the spinal nerve.**

After exit from **the intervertebral orifice (foramen intervertebrale)** every spinal nerve **divides into 4 branches** (Fig. 7; Fig. 8; Fig. 9). According to two parts of the myotome (dorsal and ventral), it divides into **two branches** (Fig. 10; Fig. 11):

- 1 **The posterior or dorsal branch (ramus dorsalis)** travel to **the autochthonous muscles of the back and overlining skin;**
- 2 **The anterior or ventral branch (ramus ventralis)** travel to **the ventral wall of the trunk and the limbs;**

In addition, **another two branches** arise from the spinal nerve:

**The communicating branch (ramus communicantes cum trunci sympathici)** travel to **the sympathetic trunk for supplying the internal organs.** There are white and grey communicating branches.

- a. The former carry **the preganglionic (myelinated) fibres** from the cells of the **lateral horns of the spinal cord** and are **coloured white** (such branches are found running from the C 8 to the L 2 or L 3).
- b. The other communicating branches carry **the postganglionic (mostly unmyelinated) fibres** from the **ganglia of the sympathetic trunk into the spinal cord.** They are darker (grey) in colour.

**The meningeal branch (ramus meningeus),** that comes back through the intervertebral orifice for supplying of **the meninges of the spinal cord.** In addition it **contains sympathetic fibres.** When it

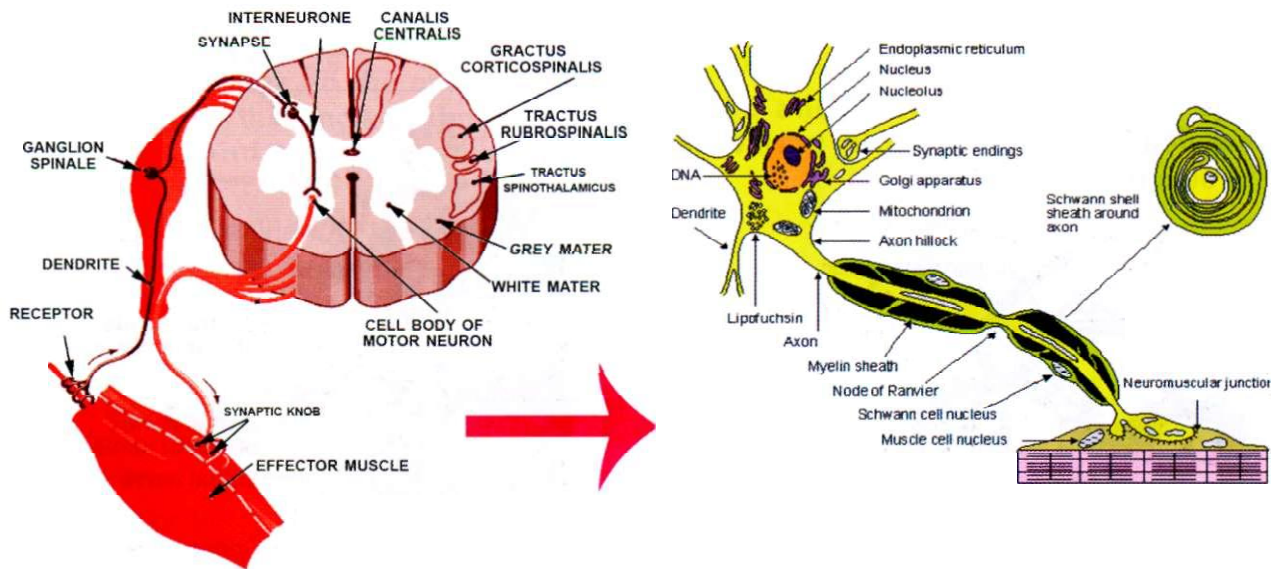


Fig. 8. Delicate structure of the complex reflex arc.

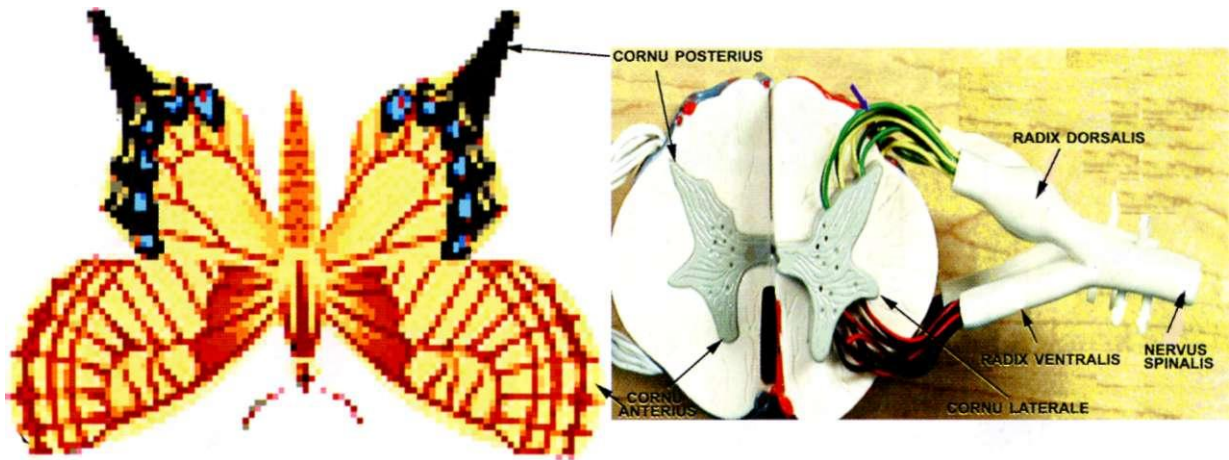


Fig. 9. Horizontal section of the spinal cord, and association with butterfly.

passes through the intervertebral foramen it divides into **two branches**:

- a. A larger branch ascending on the anterior wall of the canal.
- b. A smaller descending branch.

Each branch communicates with the neighbouring meningeal branches and with the contralateral branches. As a result forms the **anterior meningeal plexus (plexus meningeus anterior)**. Similar relations are found on the posterior wall of the vertebral canal where the **posterior meningeal plexus (plexus meningeus posterior)** forms. These plexuses send small branches to the periosteum, bones, and meninges of the spinal cord, venous vertebral plexuses, and to the arteries of the vertebral canal. In the region of the neck, the spinal nerves contribute to the formation of the **vertebral plexus (plexus vertebralis)** around the vertebral artery.

The roots of the spinal nerves stretch in the subarachnoid space from the spinal cord to the intervertebral foramen in different directions:

- 1) The roots of the superior pairs of the cervical nerves passes in horizontal direction;

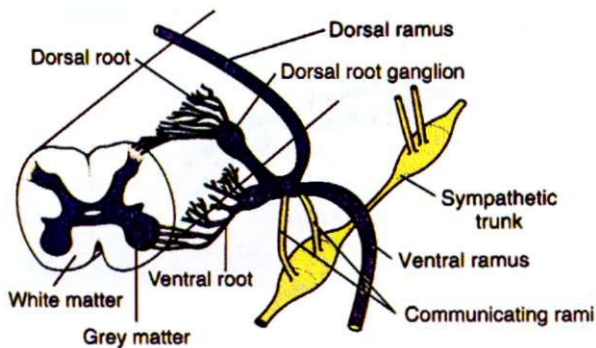


Fig. 10. Communication of spinal nerve and sympathetic trunk.

- 2) The roots of the inferior pairs of the cervical nerves passes obliquely;
- 3) The roots of the upper ten pairs of the thoracic nerves descend still more steeply and enter the intervertebral foramen approximately two vertebrae inferiorly the level of their origin;
- 4) The roots of the last two pairs of the thoracic, the next five lumbar, the five sacral nerves and the one coccygeal nerve passes vertically to form the cauda equina with the contralateral roots which is situated in the subdural space. After separating from the cauda equina, the roots run laterally and unite to form the spinal nerve

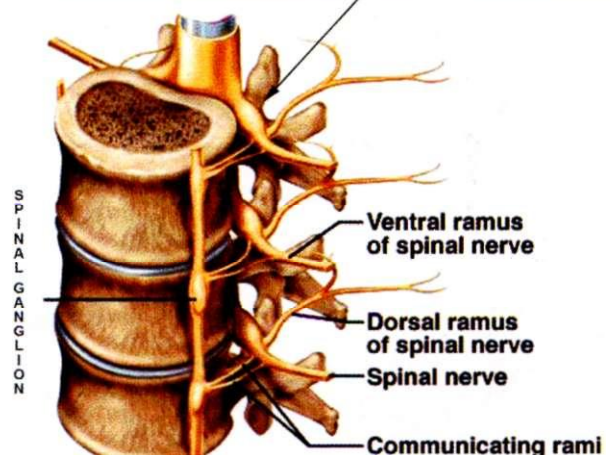
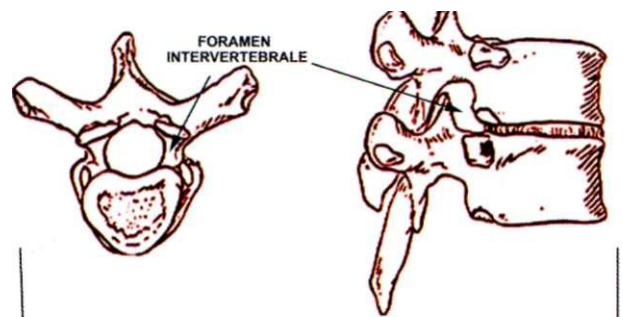


Fig. 11. Exit of the spinal nerve.

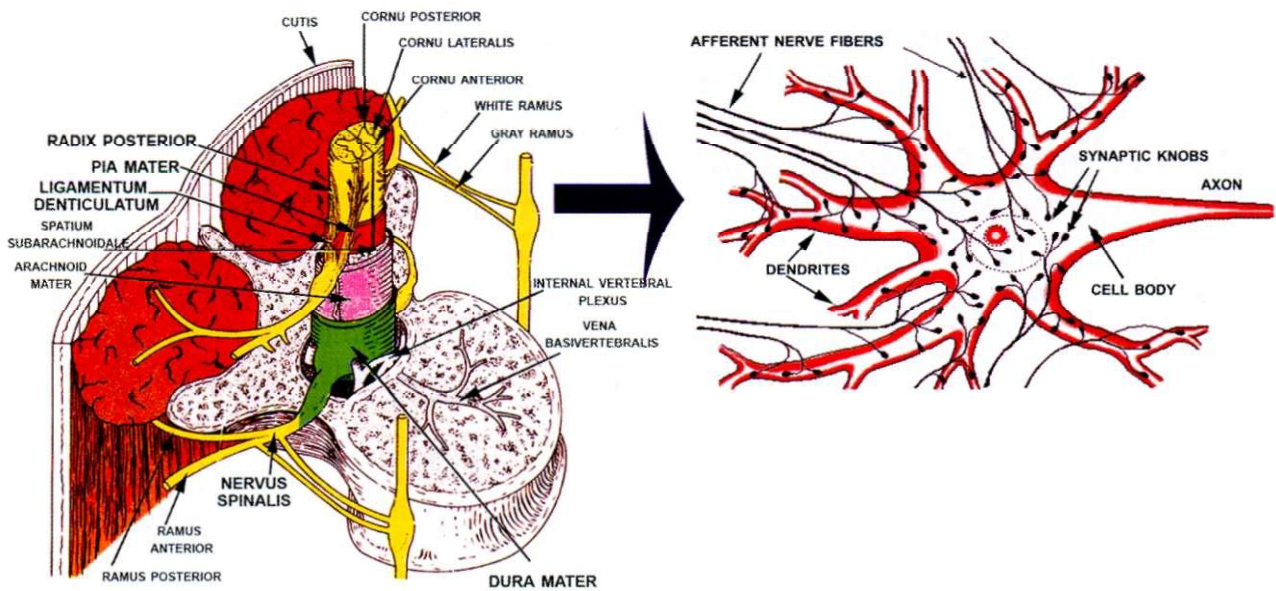


Fig. 12. Structure of the dorsal ramus and sympathetic ganglion.

while still in the vertebral canal.

## THE POSTERIOR PRIMARY BRANCHES OF THE SPINAL NERVES

The posterior primary rami of the spinal nerves (**rami dorsales nervorum spinalium**), are much thinner than the anterior rami (Fig. 11; Fig. 12). From their site of origin at the lateral surface of the superior and anterior articular processes all the posterior rami run backwards between the transverse processes of the vertebrae. In the region of the sacrum they pass through the posterior sacral foramina. Each posterior primary ramus divides into: **the medial and the lateral branches (ramus medialis et ramus lateralis)**. They carry sensory and motor fibres. The terminal branchings of the posterior primary rami supplies **the skin of all dorsal regions of the trunk, to the occiput, to the sciatic region, to the long and short muscles of the back, and to the muscles of the occiput.**

Posterior branch of the C 1, **the suboccipitalis nerve (nervus suboccipitalis)**, passes between the occipital bone and the atlas and then divides into branches supplying **mm. recti capitis major and minor, m. semispinalis capitis, and mm. obliqui capitis. Suboccipitalis nerve (nervus suboccipitalis) does not give off branches to the skin.**

The posterior branch of the C 2, **the greater occipital nerve (nervus occipitalis major)** exit between the posterior arch of the atlas and the

second vertebra, pierces the muscles and, having become subcutaneous, **innervates the occipital part of the head.**

The cutaneous branches of the L 1, L 2, L 3 pass to **the superior part of the gluteal region**

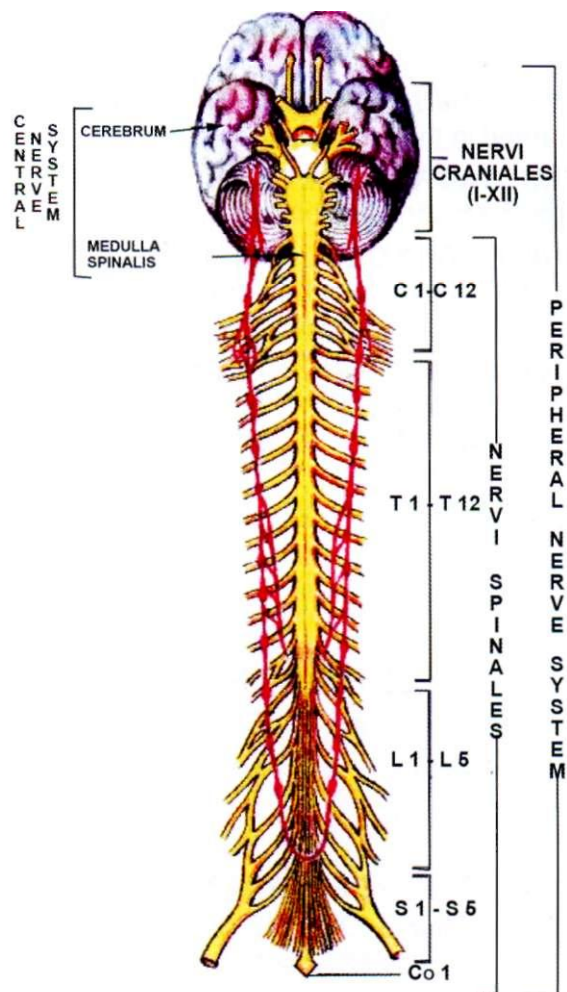


Fig.13. Structure of the central and peripheral nerve system.

under the name of **the gluteal branches of the posterior primary rami of lumbar nerves (nervi clunium superiores)**.

## THE ANTERIOR PRIMARY RAMI OF THE SPINAL NERVES

The anterior primary rami of the spinal nerves (**rami ventrales nervorum spinalium**) are thicker than the posterior rami.

The anterior primary rami, except for those of the thoracic nerves, communicate with one another widely and form plexuses. Among the anterior primary rami of the thoracic nerves, only those of T 1 and T 2, sometimes T 3, form of **the brachial plexus (plexus brachialis)**, and the branch of Th 12 form of **the lumbar plexus (plexus lumbalis)**. But they enter the plexuses only partly.

The following plexuses are distinguished according to location (Fig. 4; Fig. 13):

- 1) **THE CERVICAL (PLEXUS CERVICALIS)**. Formed in the neck.
- 2) **THE BRACHIAL (PLEXUS BRACHIALIS)**. Formed in the neck.
- 3) **THE LUMBAR (PLEXUS LUMBALIS)**. Formed in the lumbar region.
- 4) **THE SACRAL (PLEXUS SACRALIS)**. Formed in the pelvis.
- 5) **THE COCCYGEAL PLEXUS (PLEXUS COCCYGEUS)**. Formed in the pelvis.

Some authors unite first two plexuses into **THE CERVICOBRACHIAL PLEXUS (PLEXUS CERVICOBRACHIALIS)**. The rest - into **THE LUMBOSACRAL PLEXUS (PLEXUS LUMBOSACRALIS)**.

All these plexuses form from union of the corresponding primary rami in the form of **ansae - the loops**.

### 1. THE CERVICAL NERVES

There are eight pairs of the cervical nerves (**nervi cervicales**). The abbreviations are: C I to C VIII.

#### 1A. THE POSTERIOR PRIMARY BRANCHES OF THE CERVICAL NERVES

The posterior primary rami of the cervical nerves (**rami dorsales nervi cervicales**) divide

into **the medial and lateral branches (rami mediales et rami laterales nervi dorsales cervicales)**.

As already mentioned, the branches of C 1, C 2 and C 3 are set apart. They are:

1. **The posterior primary ramus of the C 1, or the suboccipital nerve (nervus suboccipitalis)** is larger than the anterior primary ramus. It passes between the occipital bone and the first cervical vertebra inferiorly to the vertebral artery in the groove for this artery in the atlas, than into the triangular space formed by the rectus capitis posterior major, obliquus capitis inferior, and obliquus capitis superior muscles and give rise **branches to these three muscles as well as to the semispinalis capitis, longissimus capitis, and rectus capitis posterior minor muscles**. The branch running to the obliquus capitis inferior muscle gives off **a communicating branch to the posterior primary ramus of the C 2**. One branch is supplies **the capsule of the atlanto-occipital joint**.
2. **The posterior primary ramus of the C 2** is the largest and passes initially between the first and second cervical vertebrae, then curves round the inferior border of the obliquus capitis inferior muscle and divide into **one long and several short branches**.
  - a. **The short branches (rami breves) supplies the semispinalis capitis, splenius capitis, splenius cervicis, and longissimus capitis muscles**.
  - b. **the long branch is named the greater occipital nerve (nervus occipitalis)**

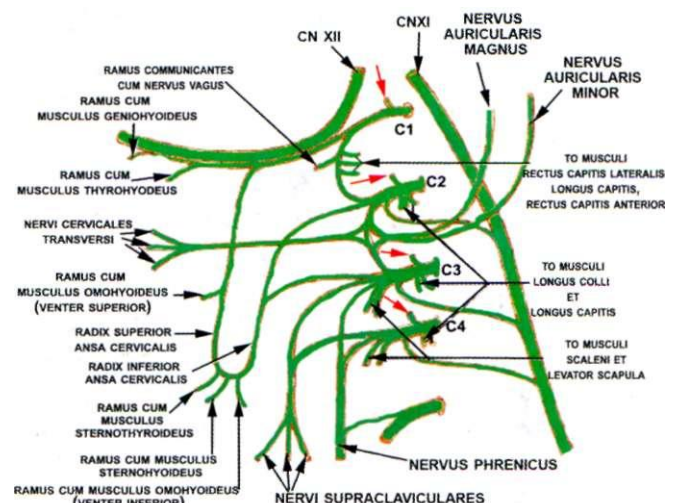


Fig. 14. Structure of the cervical plexus (red arrows - grey communicating branches to superior cervical ganglion of sympathetic trunk).

**major**). It perforates the semispinalis capitis muscle and the tendon of the trapezius muscle and supplies **the skin of the occipital region and reaches the parietal region**. The greater occipital nerve often stretches in attendance to the occipital artery and its branches. The posterior primary ramus of the C 2 gives rise to **the communicating branches that running to the posterior primary rami of the C 1 and C 3**. In the occiput it gives rise **a cutaneous branch of the cervical plexus - the lesser occipital nerve (nervus occipitalis minor)**.

3. The posterior primary ramus of the C 3 or the third occipital nerve (*nervus occipitalis tertius*), is inconstant and lies in the thickness of the skin medial to the greater occipital nerve often communicating with it. The C 3 **supplies the skin of the occipital region**.

## 1B. THE ANTERIOR PRIMARY RAMI OF THE CERVICAL NERVES

The anterior primary rami of the cervical nerves (*rami ventrales nervorum cervicalium*) and the greater part of the anterior primary ramus of the T 1 (*ramus ventralis nervi thoracici primi*) unite by help of arch-like or acute-angled ansae to form **the cervical plexus (plexus cervicalis)** and **the brachial plexus (plexus brachialis)**.

### 1. THE CERVICAL PLEXUS

The cervical plexus (Fig. 14; Fig. 15) is formed by **the anterior primary rami of the C 1 to C 4 (rami ventrales nervorum cervicalium 1 - 4)**.

Except for the first two, the anterior branches are much larger than the posterior branches. It is situated at the level of the upper four cervical vertebrae anteriorly to the insertion of the scalenus medius, levator scapulae, splenius capitis, and splenius cervicis muscles and is covered anteriorly by the upper parts of the sternocleidomastoid muscle. The four anterior primary rami form the plexus and the three ansae. The anterior primary ramus of the C 1 lies firstly on primary rami form the plexus and the three ansae. The anterior primary ramus of the C 1 lies firstly on the atlas under the vertebral artery in the groove for the artery (*sulcus arteriae vertebralis*). Then it runs laterally between the

rectus capitis anterior and rectus capitis lateralis muscles. The remaining three anterior primary rami, just like all those situated distally, on separating from the corresponding spinal nerves pass laterally in the spaces between the anterior and posterior intertransverse muscles; the vertebral artery stretches in front of them in this part. After that the anterior primary rami descend laterally, lie on the anterior surface of the levator scapulae and scalenus medius muscles, and unite here by help of branches to form **three ansae**. The inferior ramus becomes partly a component of the brachial plexus, as a result of which the fourth ansa, connecting both plexuses, forms. **Communicating branches with other nerves joins the cervical plexus and itself sends branches to the skin and muscles**.

The branches of the cervical plexus are divided into:

- 1 THE CUTANEOUS BRANCHES,
- 2 THE MUSCULAR BRANCHES
- 3 THE MIXED BRANCHES.

#### 1 THE CUTANEOUS BRANCHES:

- a. The lesser occipital nerve (*n. occipitalis minor*) originates from the C 2 and C 3, stretches to the posterior border of the sternocleidomastoid muscle, comes out from under it and often divides into two branches which are:

1. one ascend to the occiput and ramify posteriorly and superiorly the auricle in the skin region bordering posteriorly upon the ramification of **the greater occipital nerve (nervus occipitalis major) or Arnold's nerve**;
2. and another pass anteriorly upon the region

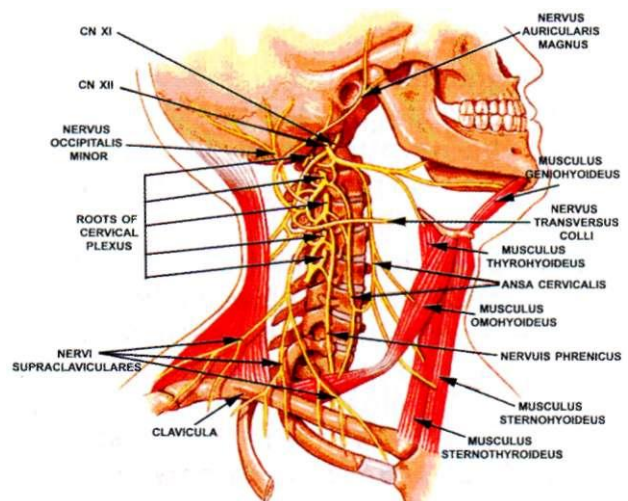


Fig. 15. Branches of cervical plexus.

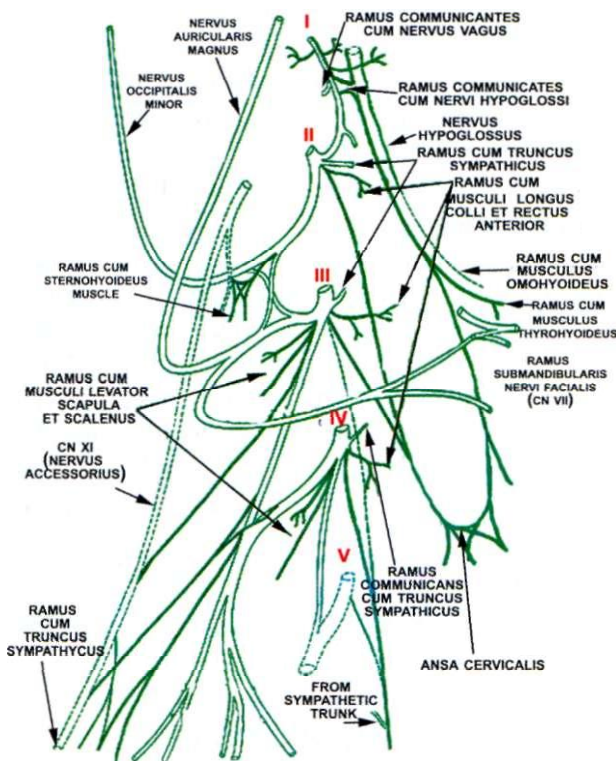


Fig. 16. Nerves of the neck.

of the great auricular nerve (**nervus auricularis magnus**).

The lesser occipital nerve has communications with the greater occipital nerve, the greater auricular nerve, and the facial nerve branches. It supplies the skin of the lateral part of the occiput.

b. The great auricular nerve (**nervus auricularis magnus**) is the largest sensory nerve of the cervical plexus. It begins from the C 3 and C 4, passes on the posterior border of the sternocleidomastoid muscle, winds round it distal to the lesser occipital nerve, and passes over to the superficial surface of the muscle. There the nerve ascends forwards to the auricle and divides into anterior and posterior branches.

1. the anterior branch (**ramus anterior**) is thinner and supply the skin in the region of the parotid gland, lobule of the auricle, and the concave surface of the concha of the auricle.
2. the posterior branch (**ramus posterior**) ramifies in the external acoustic meatus, the skin of the outer surface of the auricle and the skin posteriorly to the ear. The greater auricular nerve has connections with the lesser occipital and posterior auricular nerves.

c. The anterior cutaneous nerve of the neck

(**nervus transversus colli**) originates from the C 2 and C 3, runs on the posterior border of the sternocleidomastoid muscle, winds round it, and passes forwards in the transverse direction on the lateral surface of this muscle between it and the platysma where it divide into:

1. the larger superior branches (**rami superiores**) and
2. the smaller inferior branches (**rami inferiores nervi transversi colli**).

These branches perforate the platysma, ramify in the skin of the side and front of the neck, and extend to the inferior border of the mandible superiorly and almost to the clavicle inferiorly. The cutaneous nerve communicates with the cervical branch of the facial nerve (**ramus colli nervi facialis**) and forms with it the superficial cervical loop.

d. The supraclavicular nerves (**nervi supraclaviculares**) originate from the C 3 and C 4, pass along the posterior border of the sternocleidomastoid muscle, emerge from under it slightly lower than the anterior cutaneous nerve of the neck, and lie in the posterior triangle of the neck under the fascia. After that they perforate the fascia, descend to the clavicle, and separate radially into three groups, which are:

1. the medial supraclavicular nerves (**nervi supraclaviculares mediales**) ramify in the skin of the suprasternal notch and the manubrium of the sternum inferiorly the medial part of the clavicle;
2. the intermediate supraclavicular nerves (**nervi supraclaviculares intermedii**) are distributed in the skin in the region of the medial part of the deltoid muscle and anterior surface of the chest and stretch to the level of the fourth rib;
3. the lateral supraclavicular nerves (**nervi supraclaviculares laterales seu posteriors**) ramify in the skin in the region of the posterior parts of the deltoid muscle and the coracoid process of the scapula.

## 2 THE MUSCULAR BRANCHES

1. Many short muscular branches arise



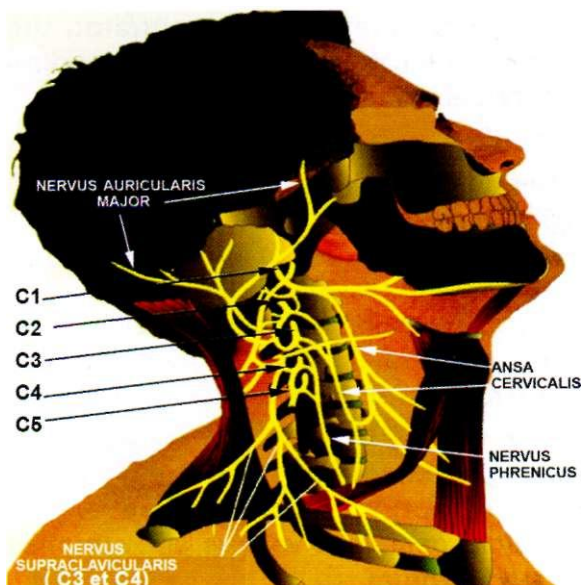


Fig. 17. Cervical plexus and sympathetic trunk.

directly from the anterior primary rami of some of **the cervical nerves (rami ventrales nervorum cervicalium)** and **supply muscles of the head, neck, and back.** These are (Fig. 16; Fig.17):

### 1. MUSCLES OF THE HEAD:

- a. **the rectus capitis anterior muscle** supplied by **C 1 (C 2);**
- b. **the rectus capitis lateralis muscle** supplied by **C 1;**
- c. **the longus capitis muscle** supplied by **C 1, C 3, (C4).**

### 2. MUSCLES OF THE NECK:

- a. **the sternocleidomastoid muscle** supplied by **C 2, C 3 and branch of accessory nerve;**
- b. **the sternohyoid muscle** supplied by **C 1, C 3 (C 4); ansa cervicalis;**
- c. **the omohyoid muscle** supplied by **C 1, C 2; ansa cervicalis;**
- d. **the sternothyroid muscle** supplied by **C 1, C - 2; ansa cervicalis;**
- e. **the thyrohyoid muscle** supplied by **C 1, C 2; ansa cervicalis; branch of hypoglossal nerve (CN XII);**
- f. **the geniohyoid muscle** supplied by **C 1, C2;**
- g. **the scalenus anterior muscle** supplied by **(C 4); C 5, C 6, C 7, (C 8);**
- h. **the scalenus medius muscle** supplied by **C 7, C 8; (C 3);**
- i. **the scalenus posterior muscle**

supplied by **C 2, C 3, C 4.**

### 3. MUSCLES OF THE BACK

- a. **the levator scapulae muscle** supplied by **(C 2), C 3, C 4, (C 5);**
- b. **the trapezius muscle** supplied by **C 2, C 3, C 4 and branch of accessory nerve;**
- c. **the anterior intertransverse muscles** supplied by **C 2, C 3, C 4, C 5, C 6 and C 7.**

### II. THE ANSA HYPOGLOSSI (ANSA CERVICALIS)

is formed by motor fibres of the anterior primary rami of cervical nerves which do not contribute to the formation of the cervical plexus. The superior and anterior roots form it.

- a. **The superior root (radix superior)** consists of motor fibres of the anterior primary ramus of the C 1 (and, less frequently, the C 2), which firstly join the hypoglossal nerve (CN XII), but then, in the region where this nerve forms an arch, separate from it to form the superior root, and only a very small part of the fibres remain components of the hypoglossal nerve. The superior root descends on the anterior surface of the common carotid artery in the thickness of the connective tissue sheath and, running downwards, forms the ansa cervicalis with the inferior root at the level of the intermediate tendon of the omohyoid muscle.
- b. **The Inferior root (radix inferior)** is composed of the motor fibres of the anterior primary rami of the C 2 and C 3, passes anteriorly the intern jugular vein, under the sternocleidomastoid muscle and at the intermediary tendon of the omohyoideus muscle joins with radix superior forming **a cervical loop (ansa cervicalis)** with this branch. By help of the branches arising from the ansa, the fibres of the cervical plexus **supplies the sternohyoid, sternothyroid and omohyoid muscles.**

### 3 THE MIXED BRANCH

**The phrenic nerve (nervus phrenicus)** originates from the C 3, C 4 and C 5, but mainly C 4 (Fig. 17; Fig. 18). It contents of sensory and

a great number of motor fibres. It descends on the anterior surface of the scalenus anterior muscle, comes close to the medial border of the muscle in the lower part of the neck, and passes between the subclavian artery and subclavian vein into the thorax anteromedially to the pleura cupula. In the cavity of the thorax the phrenic nerve lies in the superior and anterior mediastinum and reaches the diaphragm in which it ramifies freely. The right and left phrenic nerves have different course.

**a. The right phrenic nerve (nervus phrenicus dexter)** runs more vertically. In the upper parts of the thoracic cavity it crosses the right internal thoracic artery and stretches lateral to the right brachiocephalic vein and the superior vena cava. Then it passes between the pericardium and the mediastinal pleura, in a company with the pericardiophrenic artery and veins, anteriorly the root of the right lung, in line with the lateral wall of the right atrium. Anterolaterally to the vena caval opening the right phrenic nerve reaches the diaphragm.

**b. The left phrenic nerve (nervus phrenicus sinister)** has a slightly arched course. In the upper parts of the thoracic cavity it crosses the left internal thoracic artery, passes lateral to the arch of the aorta and then anteriorly to the root of the left lung, closer to the surface than the right phrenic nerve. Stretching in line with the lateral surface of the left ventricle, slightly to the back of the apex of the heart, the left phrenic nerve reaches the diaphragm more anterolaterally than the right nerve.

The phrenic nerve give raise some branches, which are:

**1. Communicating branches with:**

**a. the middle and inferior cervical ganglia of the sympathetic trunk,**

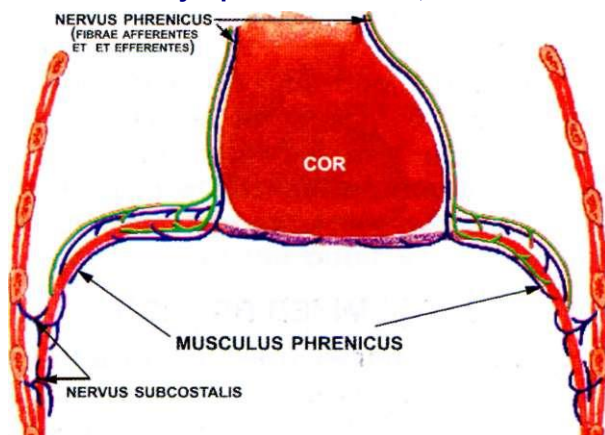


Fig. 18. Structure of the phrenic nerve.

**b. the nerve plexuses surrounding the thyrocervical trunk and the ascending cervical artery,**

**c. the ansa subclavia,**

**d. the nerve to the subclavius muscle (C 5).** Sometimes this branch and the root of the phrenic nerve from the C 5, may be so long that they extend into the thoracic cavity to join the main trunk of the phrenic nerve. In such situation it called **the accessory phrenic nerve (nervus phrenicus accessorius).**

**2. The pericardial branches (rami pericardiaci)** accompanied the pericardiophrenica vessels and **supplies the pericardium.**

**3. The pleural branches** that **extend to the mediastinal pleura in the region of the root of the lung.**

**4. The main trunk of the phrenic nerve** before penetrating of the diaphragm divide into three branches:

**a. the anterior branch (ramus anterior)** **supplies the thoracic part of the diaphragm;**

**b. the lateral branch supplies the costal part of the diaphragm;**

**c. the posterior branches supplies the lumbar part of the diaphragm.**

The three branches reach the depths of the diaphragm and ramify freely to form a net-like plexus. The branches of this plexus **communicate sometimes with the branches of the intercostal nerves.** In the anterior parts of the central trunk, at its junction with the muscular part, a communicating branch between the right and left phrenic nerves may be seen.

**5. The diaphragmatic branches continues as the phrenicoabdominal rami (rami phrenicoabdominales nervorum phrenicorum)** give rise some small branches:

**a. the branches, which take part in formation of the right and left inferior phrenic plexuses (plexus phrenicus inferior dexter et sinister).** The right plexus is the largest and contains **the phrenic ganglion (ganglion phrenicum);**

**b. the branches, which take part in formation of the hepatic plexus (plexus**

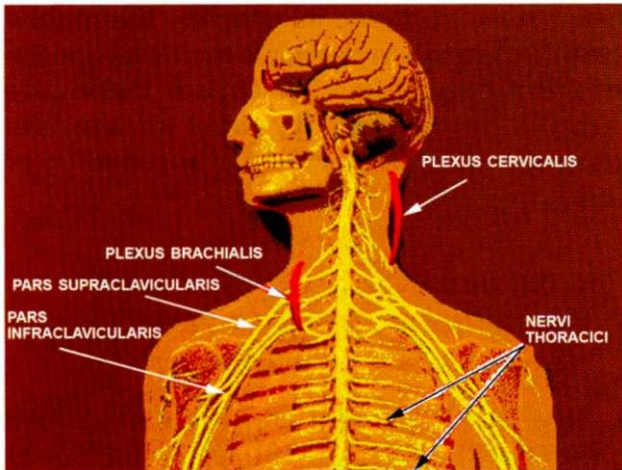


Fig. 19. Cervical and brachial plexuses.

hepaticus);

- c. the branches, which take part in formation of the gastric plexus (plexus gastricus);
- d. the branches, which supplies the peritoneum
- e. the branches, which supplies the liver;
- f. the branches, which supplies the anterior abdominal wall.

### THE COMMUNICATIONS OF THE CERVICAL PLEXUS

1. Communicating branches from the C 2, C 3 and C 4 (those from the C 3 are the largest) descend backwards to insert the branch of the CN XII to the sternocleidomastoid muscle. The communicating branches of the cervical

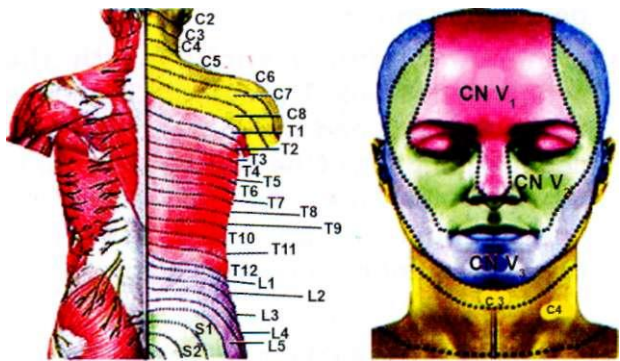


Fig. 20. Dermatomes of head, neck and trunk.

plexus together with the branches of the CN XII supplies the sternocleidomastoid and trapezius muscles.

2. The communicating branch of the first cervical nerve running to the arch of the CN XII is continuous by the superior root of the ansa cervicalis. This branch descends on the anterior surface of the common carotid artery in the thickness of its connective-tissue sheath, and at the level of the intermediate tendon of the omohyoid muscle joins the branches of C 1 to C 3 and the inferior root of the ansa cervicalis to form the ansa hypoglossi (ansa cervicalis) in front of the internal jugular vein and the common carotid artery. Nerves arising from the ansa cervicalis innervate the whole group of muscles situated inferiorly the hyoid bone the sternohyoid, sternothyroid, thyrohyoid, omohyoid, and

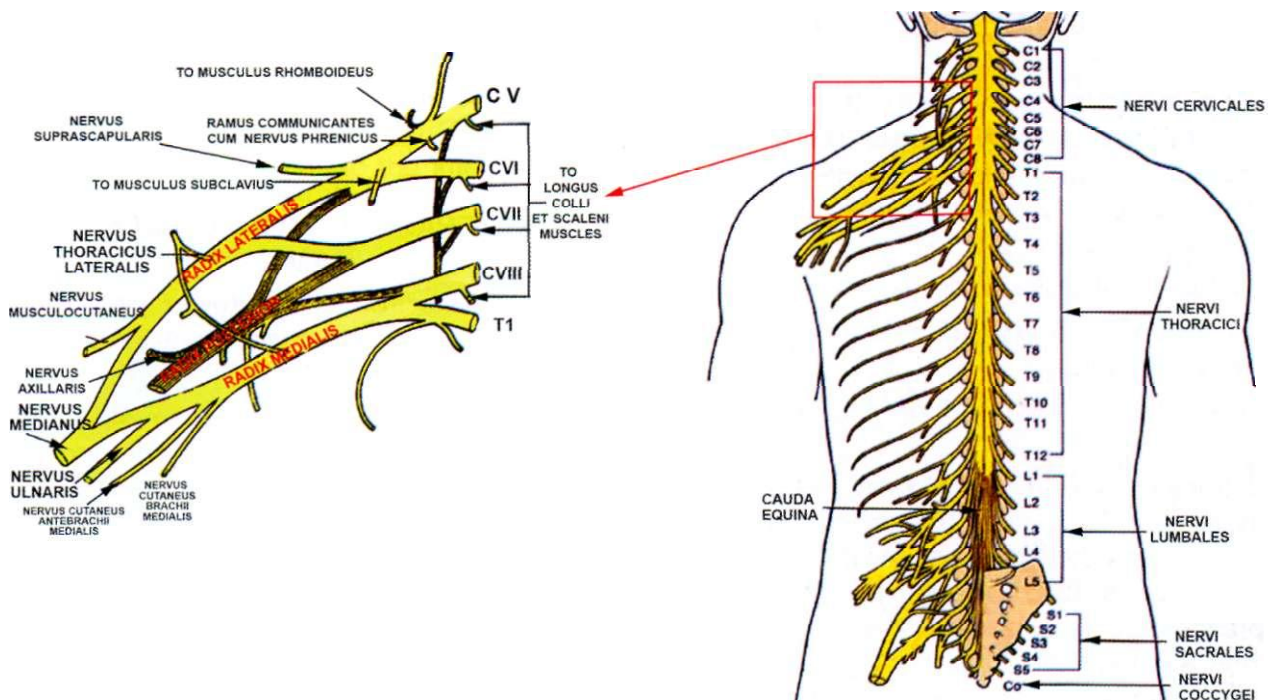


Fig. 21. Structure of the brachial plexus.

geniohyoid muscles.

3. **Communicating branches with the sympathetic trunk.** The anterior branches of the C 1, C 2 and C 3 join the superior cervical ganglion of the sympathetic trunk, those of the CN 4 communicate with the middle cervical ganglion (ganglion cervicale medium) or with the trunk.

## 2. THE BRACHIAL PLEXUS

The brachial plexus (plexus brachialis) forms by union of the anterior primary rami of the C 4 (small branch), C 5, C 6, C 7, C 8, T 1 (large portion). In addition a small part of the anterior primary ramus of the T 2 and sometimes of the T 3 join the plexus in the axillary fossa (Fig.20; Fig. 21). The forming anterior primary rami of the spinal nerves, which take part in formation of the brachial plexus, exit vertebral canal through the intervertebral foramina at the level from the fourth cervical to the first or sometimes second thoracic vertebrae. Initially the plexus is represented by the trunks of the brachial plexus (trunci plexus brachialis), which divide into:

1. The superior trunk,
  2. The middle trunk,
  3. The inferior trunk.
1. The superior trunk (truncus superior) is formed by union of the anterior primary rami of the C 5, C 6, and partly C 7;
  2. The middle trunk (truncus medius) is formed by the anterior primary rami of the C 7;
  3. The inferior trunk (truncus inferior) is formed by union of the anterior primary rami of the C 7, C 8 and T 1 and lies on the first rib next to the posterior surface of the subclavian artery.

Each trunk of the plexus divides into:

- a. the posterior or dorsal division (divisionis dorsalis) and,
- b. anterior or ventral division (divisionis ventralis).

The trunks of the plexus situated in the space between the scalenus muscles, just posterosuperiorly to the subclavian artery. They emerge from the space into the greater supraclavicular fossa in which they pass close to one another. The rami forming the brachial plexus have communicating branches with the

sympathetic trunk and its ganglia - the middle ganglion (ganglion cervicale medium) and the inferior ganglion (ganglion cervicale inferius) or cervicothoracic or stellate ganglion (ganglion cervicothoracicum or stellatum).

The brachial plexus consists of two parts:

1. THE SUPRACLAVICULAR PART.
  2. THE INFRACLAVICULAR PART.
1. THE SUPRACLAVICULAR PART (PARS SUPRACLAVICULARIS) lies in the greater supraclavicular fossa, lateral and to the posteroinferior part of the sternocleidomastoid muscle. The plexus crosses the inferior belly of the omohyoid muscle in front; the transverse cervical artery and often passes between the cords of the plexus.
  2. THE INFRACLAVICULAR PART (PARS INFRACLAVICULARIS) lies in the axillary fossa between the subscapular and serratus anterior muscles, posteriorly the pectoralis minor and major muscles.

The trunks of the brachial plexus unite to form three cords (fasciculi) (Fig. 22):

1. The lateral cord (fasciculus lateralis) situated lateral to the axillary artery;
2. The medial cord (fasciculus medialis) situated medial to the axillary artery,
3. The posterior cord (fasciculus posterior) situated posteriorly to the axillary artery.

### 1. THE SUPRACLAVICULAR PART (PARS SUPRACLAVICULARIS)

#### THE ANTERIOR PORTION OR VENTRAL RAMI

Nerves arising from the anterior portion or ventral rami of the supraclavicular part of the brachial plexus send (Fig 23; Fig. 24):

1. the muscular branches (rami musculares) to the deep muscles of the neck, and
  2. the short branches to the muscles of the shoulder girdle.
1. The muscular branches or nerves supplied to the deep muscles of the neck, which are: intertransverse, scalenus anterior, scalenus medius, scalenus superior, and longus cervicis.